# TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE


May 14, 1982

TN - BIOLOGY NO. 12

## FISH FACTS - BASIC INFORMATION FOR FISH PRODUCERS

The following is a listing of basic fish culture facts and rules of thumb that are used in the fish culture business, and should be useful for assisting fish farmers and/or potential fish farmers.

1. Idaho has 13% of all U.S. commercial trout producers.
2. Idaho produces 89% of all trout grown for the U.S. food fish market.
3. In 1980, Idaho produced 42.7 million pounds (live weight) of Rainbow Trout worth 33.4 million dollars.
4. The trout industry in Idaho is larger than the sheep industry and second only to the cattle industry in Idaho in production.
5. The Snake River aquifer produces 2-3 million gallons of water/minute at a constant $58^{o}$ F.
6. The carrying capacity of a pond is limited by oxygen consumption and accumulation of metabolic products.
7. The amount of oxygen consumed and the quantity of metabolic products are proportional to the amount of food fed.
8. Trout water temperature for good growth should be between $50^{o}$ - $65^{o}$ F., dissolved oxygen should be $>6$ ppm.
9. Optimum temperature for trout growth is $56^{o}$ F.
10. Trout death point is $82^{o}$ F.
11. Maximum temperature for trout egg production is $55^{o}$ F.
12. For every $1^{o}$ F. decrease from optimum temperature, there is a 5% decline in trout growth.
13. When temperature increases, respiration rate increases.
14. Because of water density (viscosity), temperatures should be kept at the warm end of the range so fish expend less energy.
15. Catfish require water temperatures above $70^{o}$ F. for 180-210 days for good production growth.

16. With constant $80^{o}$ F. water, catfish can reach market size (2-3 lbs.) in 10-24 months.

17. Water temperature in a pond can be increased by taking out overflow water from the bottom in the summer.

18. For every $18^{o}$ F. increase in temperature, fish will consume twice the amount of dissolved oxygen.

19. Oxygen uptake rates for trout is proportional to temperature and inversely proportional to fish size.

20. A one-pound fish uses less dissolved oxygen than ten 0.1 pound fish.

21. Less atmospheric pressure at higher elevations means less dissolved oxygen in the water.

22. For catfish, dissolved oxygen of $\geq$3 ppm is needed.

23. Dissolved oxygen concentration is always lowest at daybreak or after many days of calm cloudy weather.

24. Dissolved oxygen is reduced if a storm turns over a pond. Oxygen-short water on the bottom comes to the top.

25. Suspended solids should be kept below 80 ppm. Greater amounts adversely affect gill tissue.

26. The buildup of unionized ammonia ($NH_3$) is a limiting factor in fish production.

27. The amount of unionized ammonia is dependent upon pH and temperature.

28. To correct low pH water, add limestone.

29. Catfish spawn in Idaho only during June and July.

30. Domestic Rainbow Trout in Idaho spawn from September to June.

31. Catfish are stocked by placing all sizes in the same raceway. The market-sized fish are removed every 60 days and smaller fish added. The system is always maintained within 80-110% of carrying capacity.

32. Trout ponds or raceways are stocked at about 30% capacity with fingerlings and the entire population is harvested when they reach 100% capacity (market size).

33. Adult fish are fed 1-3% of their body weight daily, Fingerlings fed 4-5% and Fry fed 7-9% daily.

34. An average production figure is 2 pounds of feed to produce 1 pound of fish (2:1 conversion ratio). This also produces 2/3 pound of fish waste.

35. Use Hatchery Constant (HC) to determine % of body weight to feed.

Example: HC = Conversion X Length increase/month X 10

$$\frac{HC}{\text{fish length (inches)}} = \% \text{ body weight to feed}$$

36. An increase in feeding level results in a proportional decrease in carrying capacity.

37. To determine the maximum amount of food to feed and maintain good water quality use:

lbs. of food = Dissolved oxygen at inlet - dissolved oxygen at outlet X .0545 X g.p.m.

38. Fish feed should be about 32% protein with 2500 calories per pound.

39. With good management, trout can be produced at a rate of 10-20 thousand lbs/cfs of water flow of good quality. Catfish can be produced at a rate of 25-35 thousand lbs/cfs under good conditions.

40. A farm pond (recreation) in Idaho can produce 150-200 pounds of trout per acre per year on natural foods.

41. An increase in the rate of water exchange increases the carrying capacity, but this is not proportional to the rate of increase.

42. The velocity of water in a trout raceway should be about .05 ft/sec.

43. A rule of thumb for a raceway with good flow: Trout can be stocked at a density of one-half their length in pounds/cubic foot of water.

44. If 100 pounds of 2-inch trout were the maximum load that could be held in a tank, then 200 pounds of 4-inch fish, 300 pounds of 6-inch fish, and 400 pounds of 8-inch fish would also be maximum loads.

45. Loading factor example problems:

F = loading factor
W = weight of fish
L = length of fish
I = water flow (gpm)

$W = F \times L \times I$ or $F = \frac{W}{L \times I}$ or $I = \frac{W}{F \times L}$

If 900 pounds of 4-inch fish is maximum in a 150 gpm raceway then:

$$F = \frac{900}{4 \times 150} = 1.5$$

Then 1800 pounds of 8-inch fish is the same load.

$$\frac{1800}{8 \times 150} = 1.5$$

What must the flow be with an additional 450 pounds of 8-inch trout?

$$I = \frac{1800 \times 450}{1.5 \times 8} = 188 \text{ gpm}$$